

APPLICATION

OF

David J. Kuether
Phil Hilmes
Heang Lim

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ON

**SATELLITE TELEVISION NETWORK AND NEAR REAL-TIME METHOD
FOR DOWNLOADING AND VERIFYING A SUBSCRIBER REMOTE RECORD
REQUEST**

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**SATELLITE TELEVISION NETWORK AND NEAR REAL-TIME METHOD
FOR DOWNLOADING AND VERIFYING A SUBSCRIBER REMOTE RECORD
REQUEST**

5 BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to satellite broadcast television, and more specifically to a near real time system and method for downloading and verifying a
10 subscriber's remote record request via the satellite broadcast network to control a recording device such as a DVR or VCR.

Description of the Related Art

15 Satellite television programming has become widely available and has become a popular alternative to analog broadcast and cable services. Service providers such as DIRECTV® and EchoStar Communications Corp. (Dish Network™) provide a wide variety of programming. The basic
20 architecture for a satellite television network **10** is illustrated in Figure 1.

As shown in Figure 1, a DIRECTV® Access system **10** includes four primary components; a satellite broadcast center (SBC) **12** that manages subscriber services and
25 billing and stores and uplinks programming content and authorization data, one or more satellites **14** that broadcast the uplinked programming on a number of transponders, subscriber sites **16** that download and play selected programming and a back channel **18** such as the
30 public switched telephone network for communicating billing information to the SBC through a "callback" function.

Satellite broadcast center **12** includes a video server **20** that receives video and associated audio services from a program provider(s) and converts them into separate audio

and video packets that are stored in the server. These packets are of a fixed length and each has an identifier header which labels the type of packet, audio, video, CA, program guide, etc...

5 A conditional access management center (CAMC) **24**
receives (a) subscription information such as subscribed
services, rating limits, and credit and billing limits from
a subscriber service center **26**, (b) subscriber programming
10 selections during the "anniversary callback" or other
special callbacks to report billing information and (c)
current billing information including payment status,
limits, etc. from a network billing center **28** and (a) sends
new billing charges to billing center **28** and (b) generates
Conditional Access (CA) packets **30** including audio/video
15 encryption information, valid customer services, changed
subscribed services, rating limits, credit limits etc. The
CA packets **26** are assigned to a specific subscriber CAM,
sometimes referred to as an Access Card.

 A bridge router **32** is used to form multi-purpose
20 transport (MPT) packets **34**. These generic packets can be
used for a variety of purposes, most typically to download
software upgrades to the subscriber IRD. The packet
includes a payload, e.g. the software upgrade, and a header
that specifies the nature of the payload.

25 An uplink system **36** inserts a CA packet **30**, an
audio/video packet **22** or an MPT packet **34** into a transport
packet that is inserted with other transport packets into
an RF broadcast stream. The transport packet includes a
payload, e.g. the A/V, CA or MPT packet, and a header that
30 specifies the type of packet in the payload. A high power
amplifier upconverts the RF signal to a higher frequency
and power level, which is broadcast to the satellite via
transmitter **38**.

 Subscriber site **16** includes a dish **40** where a low

noise block downconverter amplifies the satellite signal and converts it to a lower frequency. This signal is then sent from the dish to the subscribers integrated receiver decoder (IRD) **42** where the individual transport packets are
5 extracted from the RF signal. The IRD then routes the video and audio packets **22** to the audio and video decoders, the MPT packets **36** to the appropriate devices, and the CA packet **30** to a conditional access module (CAM) **44**. The CAM determines if the subscriber is authorized to watch the
10 program, and if they are, sends an authorization to decode the audio and video packets and direct them to a television **46** for viewing and/or a recording device **48** such as a VCR or digital video recorder (DVR) that provides many other features and services such as Tivo® or ReplayTV®.

15 The wide variety of programming available through digital satellite and cable services renders it likely that programs will be shown at times that are not convenient for a viewer. This, in turn, results in the desirability of recording such programs for later viewing at a more
20 convenient time. Advanced models of satellite and cable receivers/decoders allow a subscriber to program the receiver to record a program for later viewing. The subscriber selects the program to be recorded from an on-screen program guide using a standard TV remote and the
25 receiver sends IR or serial commands to the VCR or DVR to execute the recordings at the proper time. A subscriber may also connect from their home computer via the internet to a service center such as DIRECTV.com to access the program guide and select programming, review current billing
30 information or even pay on-line.

 If the subscriber purchases any pay per view events, this information is then stored on the CAM, and at predetermined intervals, the CAM will initiate a callback to the Conditional Access Management Center via the phone

lines 18, where all of the subscriber's purchase information is transmitted. This purchase information is then sent to the Billing Center 28 where it gets processed for billing to the subscriber.

5 Television related products and services are available that greatly enhance the flexibility and capability of a standard video tape recorder (VTR) or DVR in conjunction with off air, cable or satellite broadcast programming. Tivo, Inc. offers features such as Season Pass™, Wish List™
10 and Smart Recording™ that record every episode of a selected program even if scheduling changes, find and record programming based on preferences and suggest programming based on viewing habits. Sonic Blue offers ReplayTV® with features such as Commercial Advance™ that
15 seamlessly removes all commercials from programming and MyReplayTV™ which allows a user, whether you are at work or on vacation, if you can get online, you can setup recordings, view your personal Channel Guide or Find Shows. The record requests are downloaded once daily during the
20 nightly "call back" that is made for billing purposes via a public phone line.

SUMMARY OF THE INVENTION

25 The present invention provides a near real time system and method for downloading and verifying a subscriber's remote record request to control a recording device such as a VCR, DVR or VTR using the existing satellite network.

30 To accomplish this, a subscriber logs into the satellite service provider's system and accesses an interactive program guide via the internet, WAP enabled cell phone, wireless personal digital assistant (PDA) or some other means. The subscriber selects a program to record and submits a remote record request that includes a program code and a subscriber ID. The programming request

is sent to a satellite broadcast center for validation and insertion into a packet that is submitted to the center's uplink stream and then broadcast at near real time via satellite. This packet is addressed to target only the subscriber's integrated receiver decoder (IRD).

The subscriber's IRD receives the packet, extracts the programming information, determines whether the request is addressed to that IRD, performs a validation test to check for programming overlap, passwords and rating limitations. If all tests are passed, the program code is tagged for recording. At the selected time, the IRD tunes to the channel specified by the program code and the DVR records the event. In many systems the IRD is integrated as part of the DVR.

The IRD then sends a verification response to the subscriber via a back channel. The packet contains a setting that allows the IRD to call out through a phone line, DSL or cable modem via the IRD's modem or other communication port, e.g. USB or Firewire®, to a subscriber utility or web site. The verification response confirms that the request has been successfully received or informs the subscriber that the request was denied or failed. In the latter case, the subscriber may be provided the opportunity to resolve a programming conflict, sign up for the requested service, increase a billing limit or change a rating limitation.

The insertion of the programming request into the continuous broadcast stream enables near real time processing of the request to accommodate same day and even last minute remote programming requests. The use of a back channel to verify the request provides the subscriber with assurance that the request has been processed successfully and flexibility to change services on the fly.

These and other features and advantages of the

invention will be apparent to those skilled in the art from the following detailed description of preferred embodiments, taken together with the accompanying drawings, in which:

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1, as described above, is a block diagram of a satellite broadcasting system;

10 FIG. 2 is a block diagram of satellite broadcasting system for downloading and verifying a remote record request in accordance with the present invention;

FIGs. 3a and 3b flowchart the steps for issuing, verifying and executing a remote record request;

15 FIGs. 4a-4e are schematic views of a PDA screen displaying remote record request and verification messages;

FIG. 5 is a diagram of a transport packet carrying an MPT packet with a remote record request; and

FIGs. 6a and 6b are diagrams illustrating IRD validation of a request and control of the DVR.

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DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a near real time system and method for downloading a subscriber's remote record request to control a recording device and for sending a verification response to the subscriber using the existing satellite network.

Although the existing satellite network **10** shown in figure 1 lacks the capability to download and verify remote record requests, the capability can be provided in a satellite network **50** as shown in figure 2, in which like numbers are used for existing network components, with minimal modifications to the software and communication links.

A subscriber is provided with a personal communication

device **52** such as a PDA, WAP enabled phone, palm phone, wired or wireless laptop computer. The subscriber logs into the satellite service provider's system and accesses an interactive program guide **54** via the internet, wireless
5 network or some other means **56** to review and then select a program such as provided by DIRECTV.com. The subscriber issues a remote record request **57** that includes a program code and, generically, a subscriber ID, which can be the subscriber's account or other identifying number or a
10 manufacturer's number for the subscriber's IRD or CAM.

The satellite broadcast center **12** is provided with a secure I/O port **58**. The port serves as a "firewall" to ensure system integrity and enable communications between a remote subscriber and the satellite network via the
15 internet, wireless network or some other means **56**. For example, the port may be a website address to which all remote record requests are directed. A validation switch **60** is provided either in the port or, as shown here, between the port and bridge router **32**. When presented with
20 a remote record request, the validation switch **60** queries the billing center **28** or, alternately, the CAMC **24** to validate the request (service package, subscriber ID, billing limits, rating limits). If valid, the request is directed to the bridge router **32**, which inserts the request
25 information (program code, subscriber ID, override information) into an MPT packet **34**. The MPT packet is forwarded to uplink system **36** where it is inserted into a transport packet and uplinked to satellite **14** for transmission in a broadcast stream **61**.

30 At subscriber site **16**, currently existing IRDs **42** although capable are not configured to execute a remote record request. Consequently, when a subscriber first signs up for the remote record request service, a software

download (MPT packet) is sent to the subscriber's IRD to enable downloading, executing and verifying a remote record request. Next generation IRDs will most likely be configured to support this feature without such a patch.

5 Upon receipt of a transport packet carrying an MPT packet **34** with a remote record request, the properly configured IRD **42** determines that it is an MPT packet, decodes the packet and compares the subscriber ID information in the packet to similar ID information
10 (manufacturer ID or subscriber ID) resident in the IRD to determine whether the remote record request is directed to that subscriber site. If not, the IRD ignores the request. If so, the IRD validates the request (no conflicts, enough memory, etc.) and tags the program code for recording,
15 which in turn programs the recording device **48** to record the event. The IRD sends a verification response that the request was received and either executed or rejected and, if so, why via backchannel **18** to the CAMC **24**, which forwards the response to the subscriber via the internet,
20 wireless network or some other means **56**. Alternately, the verification response can be sent via a different backchannel such as an ISP or, perhaps, directly to the subscriber, such as an e-mail, bypassing the SBC altogether.

25 The specific sequence of steps involved in initiating, delivering, validating and verifying a remote record request are illustrated by way of a specific illustrative example in figures 3a and 3b with reference to figures 4 through 6. In this example, the subscriber has left home
30 and forgot to set the DVR to record the Wimbledon® tennis finals as he had promised his wife and daughter. Our subscriber is standing on the 4th tee of his favorite golf course when he realizes he forgot to set the DVR and the match starts in only 30 minutes. Unbeknownst to our

subscriber, Wimbledon® tennis is now carried on a pay-per-view tennis channel outside his standard subscription, his older son has already programmed the DVR to record a conflicting program and the DVR hard disk is almost full.

5 To initiate a remote record request, our subscriber removes his wireless PDA **52** from his golf bag and logs into the service provider's system (step **70**). As shown in figure 4a, the subscriber uses a stylus **72** to select the "TV Program Guide" icon **74** on the display screen **76** of his
10 wireless PDA **52**. The system verifies the subscriber or PDA ID as valid and as having an active service program that supports remote record requests. If the subscriber's current package does not support remote requests, the subscriber is prompted to add that service and continue.
15 Assuming proper validation, the subscriber is provided access to account information and an additional link is opened up to allow the subscriber to review an interactive program guide (step **78**). Alternately, the program guide could be downloaded off-line and then accessed at a later
20 time. In this case, the request capability is either validated when the guide is downloaded or at the SBC when the request is made.

 The subscriber works his way through the screens of the program guide to the Wimbledon® tennis program as shown
25 in figure 4b, selects the program, selects record program once or all occurrences, and hits send (step **80**). Feeling relieved, the subscriber turns his wireless PDA to vibrate, sticks it in his pocket and proceeds down the fairway.

 Meanwhile, the remote record request is directed via
30 the internet, wireless network or some other means **56** to the secure I/O port **58** in satellite broadcast center **12** (step **82**). SBC 12 receives the remote record request **57** (step **84**). Validation switch **60** confirms that our subscriber is in fact a subscriber, confirms that the

selected tennis program does not exceed any rating limits but rejects the request because the "tennis package" is not part of the subscriber's current package and the Wimbledon@ Finals have a premium charge of \$34.95, which is above the one-time billing limit. The broadcast center formulates a verification response that (a) rejects the request, (b) indicates why the request was rejected, e.g. outside package and exceeds billing limit and (c) prompts the subscriber to sign up for the required package and increase the billing limit (step **86**). This response is relayed back to the subscriber in near real-time over the same or different wireless connection to the subscriber's wireless PDA causing it to vibrate in the middle of the subscriber's backswing.

Showing great composure, the subscriber stops his swing, answers the PDA, presses the blinking message icon and is presented with the rejection message as shown in figure 4c. The subscriber quickly checks the boxes to purchase the tennis package and to override the billing limit and hits send (step **88**). The billing center records the new package subscription and spending override and validates the request (step **90**). The new package and billing limit info is sent out to the subscriber IRD immediately in an MPT packet to update the settings in the subscriber's CAM.

Once validated, the programming request (program code), any override information and the subscriber ID (CAM ID, IRD ID or subscriber ID) are directed to bridge router **32**, which creates an MPT packet **34** (step **92**) with a unique packet ID number for each recording request. The uplink system **36** inserts the MPT packet into a transport packet **94** as shown in figure 5, which, in turn, is inserted into the broadcast chain along with the audio, video and CA transport packets for delivery to the subscriber sites

(step **96**). The transport packet includes a payload **98**, e.g. the MPT packet **34**, and a header **100** that specifies the payload is an MPT packet including a subscriber ID **99** and a program code **101**. Since it is not possible to know what transponder the subscriber's IRD is currently tuned, the transport packet is broadcast out on all transponders in the satellite to ensure delivery (step **102**). This is necessary to prevent any service or recording interruptions in case the subscriber IRD is already in the process of recording an event. The remote record request can be cycled into the broadcast several times in a given duration to help assure receipt in case of signal interruption, such as rain fade. Since the MPT packet has a unique ID, and the IRD validates the MPT packet, the IRD will ignore all subsequent MPT packets with the same ID.

Upon receipt of a transport packet carrying an MPT packet **34** with a remote record request, the IRD **42** determines that it is an MPT packet, decodes the packet and compares the subscriber ID in the packet to similar ID information resident in the IRD to determine whether the remote record request is directed to that subscriber site (step **103**). Once the IRD confirms that the requesting subscriber and the subscriber IRD match, the IRD validates the programming request (step **104**). In no particular order, the IRD validates the program code, revalidates that the requested program is included in the subscriber's package (optional), revalidates that the request does not exceed the billing limit (optional), validates that the request does not conflict with a pre-existing request and validates that the DVR has enough memory to store the programming (step **106**).

In our example, the program number 123456 is a valid number, the premium fee of \$39.95 is less than the newly updated one-time billing limit of \$50 and tennis package

(code 49) is included in the newly updated service package. However, the request to record from 1-4 pm on Sunday unfortunately conflicts with a pre-existing request to record from 3-5 pm on Sunday and the DVR is running out of
5 memory, only 300 Mb left and 1 Gb required for the recording as illustrated in figure 6a. Depending upon the override status of the current request, the IRD will either override the earlier request and delete old or low priority programming from memory to process the current request or
10 will send a "request unsuccessful" message back to the subscriber, suitably via the satellite broadcast center, asking him to make an override decision (step **108**). In his hurry our subscriber had not checked the override box, so a message is sent in near real-time to the subscriber's
15 wireless PDA causing it to vibrate once again. While waiting his turn to putt, our subscriber answers the PDA, clicks the message icon, reads the message indicating a "programming conflict" and "low memory", quickly clicks "override" and sends the message as shown in figure 4d
20 (step **110**).

The override message is directed to the I/O port **58**, validated, formatted into an MPT packet **34**, inserted into a transport packet and uplinked into the broadcast stream (step **112**). The IRD downloads the transport packet,
25 decodes the MPT packet, validates the subscriber, processes the override request by deleting the earlier request and deleting the oldest or lowest priority programming currently saved on the DVR and programs the DVR to record the Wimbledon® tennis program (step **114**). As shown in
30 figure 6b, the necessary overrides have been set. The IRD then issues a "request valid & executed" message, which is routed to the subscriber (step **116**). Now on the 5th tee, the subscriber answers his PDA, clicks the message icon and is relieved to see verification, as shown in figure 4e,

that the Wimbledon® tennis match is being recorded on time as promised (step 118). The verification may also provide other account information such as current billing, other record requests, memory left, executed overrides, etc.

5 As this example illustrates, the capability to provide near real-time response and verification of the request are critical elements in any commercially successful remote programming service. Almost by definition, the remote record request will be used when a subscriber forgets to
10 program the DVR or is running late. Near real-time service and ability to interact via verification messages is a must in these circumstances. By using commercially available wired or wireless internet and by inserting the request in standard packets in the satellite broadcast stream, the
15 initiation, delivery, validation and verification of a remote record request can be done in near real-time. Furthermore, by validating at the program guide, billing center and subscriber IRD, the subscriber can be provided with timely and informative messages that allow him or her
20 to expand their subscription package, override rating or spending limits, override conflicting programming and override space limitations on the DVR on the fly and in near real-time.

 While several illustrative embodiments of the
25 invention have been shown and described, numerous variations and alternate embodiments will occur to those skilled in the art. Such variations and alternate embodiments are contemplated, and can be made without departing from the spirit and scope of the invention as
30 defined in the appended claims.